

A Relativistically Expanding Radio Source associated with GRO J1655-40

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GRO J1655-40 was discovered as a new, bright X-ray source with the BATSE detector of the Gamma Ray Observatory (GRO) on July 27, 1994. During the subsequent radio outburst we completed VLBI synthesis imaging observations at a frequency of 2.29 GHz. An unprecedented angular motion of $65 \pm 5 \text{ mas day}^{-1}$ was observed between two components of complex and disparate morphology, or equivalently, an apparent transverse motion of $1.3c \pm_{0.6c}^{0.7c}$ using the likely distance range of $3.5 \pm 1.5 \text{ kpc}$ as inferred from H_I absorption measurements. This separation late indicates that the two components were at zero separation near the onset of the radio flare. Similar to the recently reported GRS 1915+105 it seems that the motion of material ejected from a stellar mass compact object with at least a mildly relativistic velocity may explain the observed radio structural changes in GRO J1655-40. The minimum intrinsic expansion speed of the radio source must be (with minimal assumptions) $0.65c \pm_{0.30c}^{0.18c}$ if the expansion is two sided, and $0.79c \pm_{0.22c}^{0.11c}$ if one of the two components is a core and the expansion is one-sided. The two week delay between the X-ray outburst and the production of radio components may indicate that the X-rays were produced by a super-critical accretion process onto the compact member of this stellar binary system. This process inhibited or smothered the ejection of radio components until the accretion disk stabilized.

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